



NPL-U11-2-412041

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF EMERGENCY AND REMEDIAL RESPONSE
HAZARDOUS SITE EVALUATION DIVISION
SITE ASSESSMENT BRANCH

HRS DOCUMENTATION RECORD COVER SHEET

Crossley Farms
Region III

Name Change Notice:

Early in the evaluation of this site, its name is as it is shown here on the cover page (and in some cases elsewhere in the documentation record). At the end of the evaluation, EPA concluded that the following name is more appropriate:

Crossley Farm.

AMM 7/16/91

This package has undergone and passed EPA quality assurance for proposal to the National Priorities List.

Richard Webster 4/27/91

Regional Coordinator

Date

George H. H. H. 2/27/91

Branch Chief

Date

AR100312

CROSSLEY FARMS

HRS PACKAGE QC CHECKLIST

For NPL Update 11

- ✓ 1. Review the site's eligibility for the NPL. Please consider each of the following special circumstances in your review, as appropriate.
- Petroleum Exclusion status
 - RCRA status - adequate documentation required
 - Aggregation issues
 - Ground-water plumes - likely sources identified
- ✓ 2. Check accuracy of math calculations for any factors not included in Prescore.
3. Evaluate documentation as follows:
- ✓ a. Verify that all statements of fact or data have a reference with page numbers (primary sources should be used where available).
 - ✓ b. Determine that full copies of all non-publicly available references are included and legible. Please note that the HRS preamble and rule are publicly available and therefore do not need to be included.
 - ✓ c. Verify that the actual reference number appears on the reference itself.
 - ✓ d. Ensure that all maps for each pathway are included and legible (all targets, samples, and sources should be identified on maps, and maps must be reproducible in black and white).
 - ✓ e. Check that the list of references includes: title, author, date, affiliation, and page numbers (or total number of pages if entire reference is included).
 - ✓ f. Remove references not cited.
- ✓ 4. Include narrative summary and NPL characterization data.
- ✓ 5. Proofread for spelling and typographical errors.
- ✓ 6. Ensure that this checklist is attached to 3 full copies of the HRS package and references (along with the diskette containing the scoresheet and documentation).

I certify that, to the best of my knowledge, the attached is a complete and accurate HRS package.

Margaret Jones
(EPA Regional Reviewer Signature)

2-26-91
(Date)

I certify that Region 3 requests CROSSLEY FARMS be evaluated for placement on the NPL.
(Site name)

Peter W. Schell
(EPA Regional Superfund Branch Chief Signature)

2-27-91
(Date)

FAX TRANSMISSION			
TO:	<u>RIK WEBSTER</u>		
PH:	<u>475-9703</u>	Mail Code:	<u>05230</u>
FM:	<u>7-3301</u>		
1 of 3	CONFIRM	TIME:	<u>8:15</u>

R-585-12-0-12

HAZARD RANKING SYSTEM OF
CROSSLEY FARMS
PREPARED UNDER

TDD NO. F3-9006-30
EPA NO. PA-2203
CONTRACT NO. 68-01-7346

FOR THE
HAZARDOUS SITE CONTROL DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

FEBRUARY 22, 1991

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY


GEORGE HORVAT
PROJECT MANAGER

REVIEWED BY


TIMOTHY UNGRADY
GEOLOGIST

APPROVED BY


GARTH GLENN
REGIONAL MANAGER,
FIT 3

AR100314

HRS DOCUMENTATION RECORD - - REVIEW COVER SHEET

Name of Site: Crossley Farms

Contact Persons

Site Investigation:

Denice Taylor

(215) 687-9510

Documentation Record:

George Horvat

(215) 687-9510

Pathways, Components, or Threats Not Evaluated

Because of a lack of targets, the surface water and air migration pathways were not evaluated. The soil exposure pathway was not evaluated because of a lack of targets and the likelihood that not many people would be traversing the site.

The groundwater pathway was considered the major pathway of concern due primarily to the documentation of an observed release and Level I contamination of targets.

AR100315

HRS DOCUMENTATION RECORD

Name of Site: Crossley Farms

EPA Region: III

Date Prepared: January 4, 1991

Street Address of Site: Huff's Church Road, Hereford Township, Pennsylvania 19503

County and State: Berks, Pennsylvania

General Location in the State: Southeastern Pennsylvania

Topographic Map: East Greenville, Pennsylvania

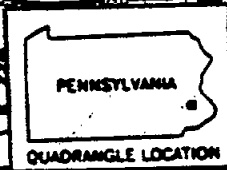
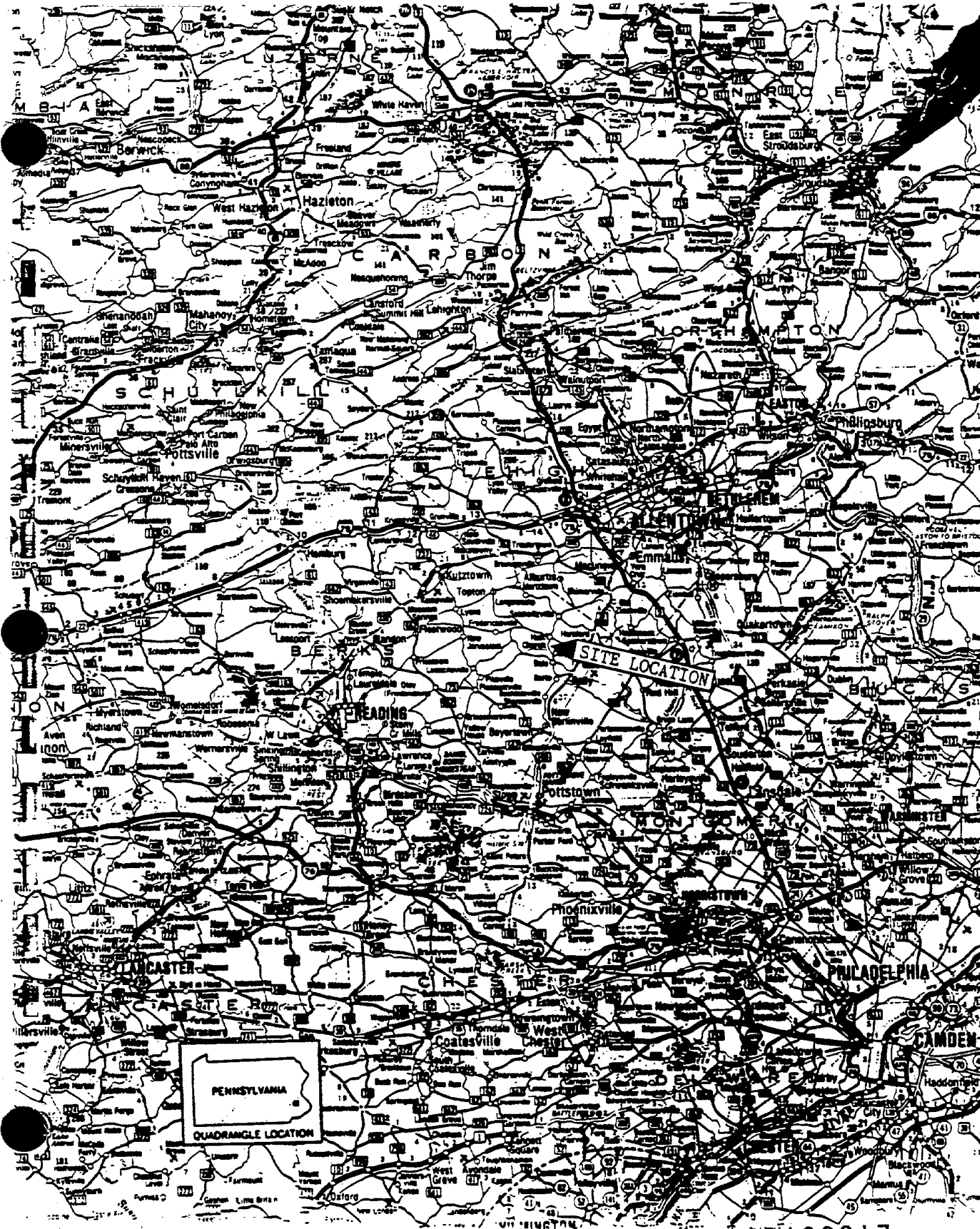
Latitude: 40° 26' 09" N

Longitude: 75° 57' 07" W

Scores

Groundwater Pathway	<u>59.32</u>
Surface Water Pathway	<u>-</u>
Soil Exposure Pathway	<u>-</u>
Air Pathway	<u>-</u>
HRS SITE SCORE	<u>29.66</u>

AR100316



AR100317

WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S²</u>
1. Groundwater Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	<u>59.32</u>	<u>3,518.86</u>
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	<u>-</u>	<u>-</u>
2b. Groundwater to Surface Water Migration Component (from Table 4-25, line 28)	<u>-</u>	
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	<u>-</u>	
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	<u>-</u>	<u>-</u>
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	<u>-</u>	<u>-</u>
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		<u>3,518.86</u>
6. HRS Site Score: Divide the value on line 5 by 4 and take the square root.	<u>29.66</u>	

AR100318

REFERENCES

- | Reference Number | Description of the Reference |
|------------------|--|
| 1. | United States Environmental Protection Agency. Final Hazard Ranking System. December 14, 1990. |
| 2. | Roy F. Weston, Incorporated. IT Corporation. Regional Hydrogeologic Investigation, Town of Hereford Site. Environmental Protection Agency Work Assignment No. 0-14, August 15, 1988. 280 pages. |
| 3. | United States Geological Survey. East Greenville, Pennsylvania Quadrangle, 7.5 Minute Series. <u>Topographic Map</u> . 1956, photorevised 1969 and 1973, photoinspected 1980. |
| 4. | NUS Corporation, FIT 3. Listing site inspection work plan, Hereford Township; site reconnaissance logbook no. 1963. TDD No. F3-9001-36, March 1, 1990. 12 pages. |
| 5. | United States Environmental Protection Agency. Site Analysis, Crossley Farms, Hereford, Pennsylvania. TS-PIC-90125, October 1990. 27 pages. |
| 6. | NUS Corporation, FIT 3. Crossley Farms site sketch. March 2, 1990. 1 page. |
| 7. | Acker, Lorie, United States Environmental Protection Agency, to File. Summary of Confidential File Material Relating to the Crossley Farms Site. December 17, 1990. 1 page. |
| 8. | Deleted |
| 9. | Deleted |
| 10. | Roy F. Weston, Incorporated, and IT Corporation. Plate 1: Topographic Survey of Hereford Project Area. Regional Hydrogeologic Investigation, Town of Hereford Site. Environmental Protection Agency Work Assignment No. 0-14, August 15, 1988. (Residential and monitoring well sample data added by NUS FIT 3.) 1 page. |
| 11. | Remcor, Incorporated. Prepared for Allegheny International, Incorporated. Final Phase III Remedial Investigation Report, Bally Engineered Structure Site. Project No. 88548.37, May 1989. 218 pages. |
| 12. | Deleted |
| 13. | Deleted |

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14. Pennsylvania Department of Environmental Resources, Bureau of Topographic and Geologic Survey. Atlas of Preliminary Geologic Quadrangles of Pennsylvania. Map 61, 1981. 2 pages.
15. Pennsylvania Department of Environmental Resources, Bureau of Topographic and Geologic Survey. Groundwater Inventory System; Berks County: District, Hereford, Longswamp, and Washington Townships. August 1983. 35 pages.
16. Pennsylvania Department of Environmental Resources, Bureau of Topographic and Geologic Survey. Physiographic Provinces of Pennsylvania. Map 13, Third printing, 1979. 1 page.
17. Buckwalter, T.V., Pennsylvania Department of Internal Affairs, Bureau of Topographic and Geologic Survey. Geology of the Precambrian Rocks and Hardyston Formation of the Boyertown Quadrangle. Atlas 197, 1959. 11 pages.
18. Hall, George M., United States Geological Survey and Pennsylvania Geological Survey. Groundwater in Southeastern Pennsylvania. Water Resource Report 2, 1934. 24 pages.
19. Wood, Charles R., Herbert N. Flippo, Jr., Joseph B. Lescinsky, and James L. Barker, United States Geological Survey. Water Resources of Lehigh County, Pennsylvania. Water Resource Report 31, 1972. 5 pages.
20. Bedrock Aquifer Groundwater Flow and Geologic Map. (Presented in documentation record.) 2 pages.
21. Longwill, Stanley M., and Charles R. Wood, United States Geological Survey. Groundwater Resources of the Brunswick Formation in Montgomery and Berks Counties, Pennsylvania. Bulletin W 22, 1965. 6 pages.
22. Wastex Industries, Incorporated. Sample Analysis for B.E.S. Environmental of Stephens Home Well, Sample No. 890112.141. January 12, 1989. 2 pages.
23. Deleted
24. Mortenson, Martin, Geologist, United States Environmental Protection Agency, Environmental Response Branch, to Gerry Heston, United States Environmental Protection Agency, On-Scene Coordinator. Correspondence. March 2, 1988. 4 pages.
25. Steinrock, John, Pennsylvania Department of Environmental Resources, Reading District, with Jill Hartnell, NUS FIT 3. Telecon. June 28, 1990. 1 page.
26. Steinrock, John, Pennsylvania Department of Environmental Resources, Reading District, with Denice Taylor, NUS FIT 3. Telecon. June 29, 1990. 4 pages.
27. NUS Corporation, FIT 3. Calculation Sheet for Sample Quantitation Limits. (Presented in documentation record.) 1 page.

AR100320

28. Garner, F.C., and G.L. Robertson. Evaluation of Detection Limit Estimators; Combined with M.F. Delaney. Multivariate Detection Limits for Selected Ion Monitoring Gas Chromatography - Mass Spectrometry. Chemometrics and Intelligent Laboratory System. 3:45-59. 1988. 14 pages.
29. Steinrock, John, Pennsylvania Department of Environmental Resources, with George Horvat, NUS FIT 3. Telecon. July 11, 1990. 1 page.
30. United States Environmental Protection Agency, Drinking Water Standards and Health Advisories. Quick Look List. Office of Drinking Water, Groundwater Protection Branch, Washington, D.C. April 1989. 10 pages.
31. Superfund Chemical Data Matrix, April 1991, Office of Emergency and Remedial Response.
32. United States Geologic Survey. East Greenville, Pennsylvania Quadrangle, 7.5 Minute Series. Topographic Map. 1956, photorevised 1969, and 1973, photoinspected 1980. Combined with Manatawny, Pennsylvania Quadrangle, 7.5 Minute Series. Topographic Map. 1957, photorevised 1969 and 1973. 1 page.
33. NUS Corporation, FIT 3. Calculation Sheet for Groundwater Population Targets (Presented in documentation record). 5 pages.
34. United States Department of Commerce, Bureau of the Census. 1980 Census of Population, Volume I, Characteristics of the Population, Chapter B, General Population Characteristics, Part 40, Pennsylvania. PC80-1-B40, August 1982. 2 pages.
35. Federal Registry Database System. Public Water Suppliers in Region III, Berks County, Pennsylvania. 1988. 1 page.
36. Berks County Planning Commission. Berks County Sewer and Water Systems. February 1982. 3 pages.
37. Packard, Michael, Pennsylvania Department of Environmental Resources, Bureau of Water Resources, State Water Plan Division, with Jill Hartnell, NUS FIT 3. Telecon. June 22, 1990. 2 pages.

AR100321

A SITE LOCATION AND LAYOUT

The Crossley Farm site is located in Hereford Township, Pennsylvania. The site is situated in the southwestern section of the Crossley Farm property, near the western slope of Blackhead Hill [ref. nos. 2 (p. 6) and 3].

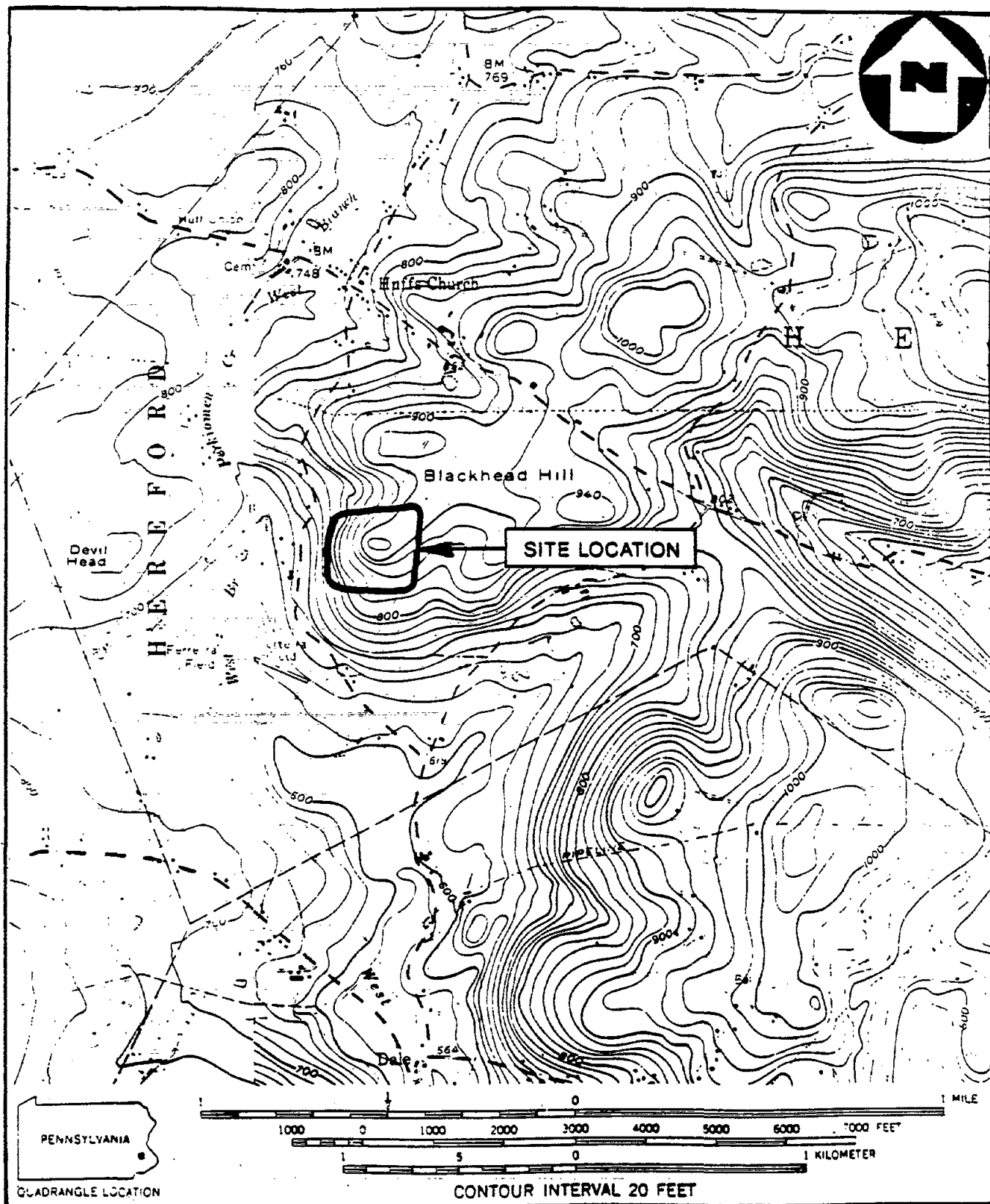
The site consists of an abandoned quarry, a borrow pit, and other small excavations located in a wooded area on Crossley Farm atop Blackhead Hill. The abandoned quarry is situated on a small hill with steeply dipping slopes to the west and south; gentler slopes are to the north and east [ref. no. 2 (p. 6) and ref. no. 3 (documentation record)]. The abandoned quarry is currently filled with large boulders and quarry rubble/spoil [(ref. nos. 4 (p. 5) and 5 (pp. 23 and 24)]. A tire pile and several small trash piles are located immediately north and northeast of the quarry. Residential homes are located at the bottom of the western slope of Blackhead Hill on Forgedale Road [ref. nos. 3 (doc. rec.) and 6 (doc. rec.)]. A borrow pit is located approximately 450 feet east of the abandoned quarry [ref. no. 5 (pp. 21 and 22)]. The borrow pit is a clearing from where (it is believed) the top soil was excavated [ref. no. 4 (p. 6)]. This area is relatively flat; cultivated fields border the area to the east and south. The trash piles are located to the north, along with a cultivated field [ref. no. 4 (pp. 5, 6, and 9)]. Several other small excavations were identified in aerial photographs [ref. no. 5 (pp. 20 and 22)]. These excavations are discussed in more detail in section B-1.

The site is situated in a rural area with residential houses concentrated to the northwest and south (ref. no. 3). An area located north of the site on the Crossley Farm property is being utilized by the farm for the disposal/storage of what appeared to be household waste [ref. no. 4 (p. 5)].

A.1 Site History and Operations

Aerial photographs indicate that a quarry was in operation before 1946 [ref. no. 5 (pp. 9 and 10)]. There is no information that indicates exactly when the quarry operations began or when they stopped.

Illegal waste disposal activity reportedly occurred at the site from the mid-1960s to the mid-1970s. Drums containing mostly liquid waste were obtained from Bally Case and Cooler and disposed on the Crossley Farms property. Several of the drums had a characteristic solvent odor. The drums were reportedly disposed in a hole described as an "ore pit" (ref. no. 7). It is possible that the "ore pit" and the abandoned quarry are one and the same. The reasons for this postulation are described in section B-1.



SOURCE: (7.5 MINUTE SERIES) U.S.G.S. MANATAWNY & EAST GREENVILLE, PA QUADS.

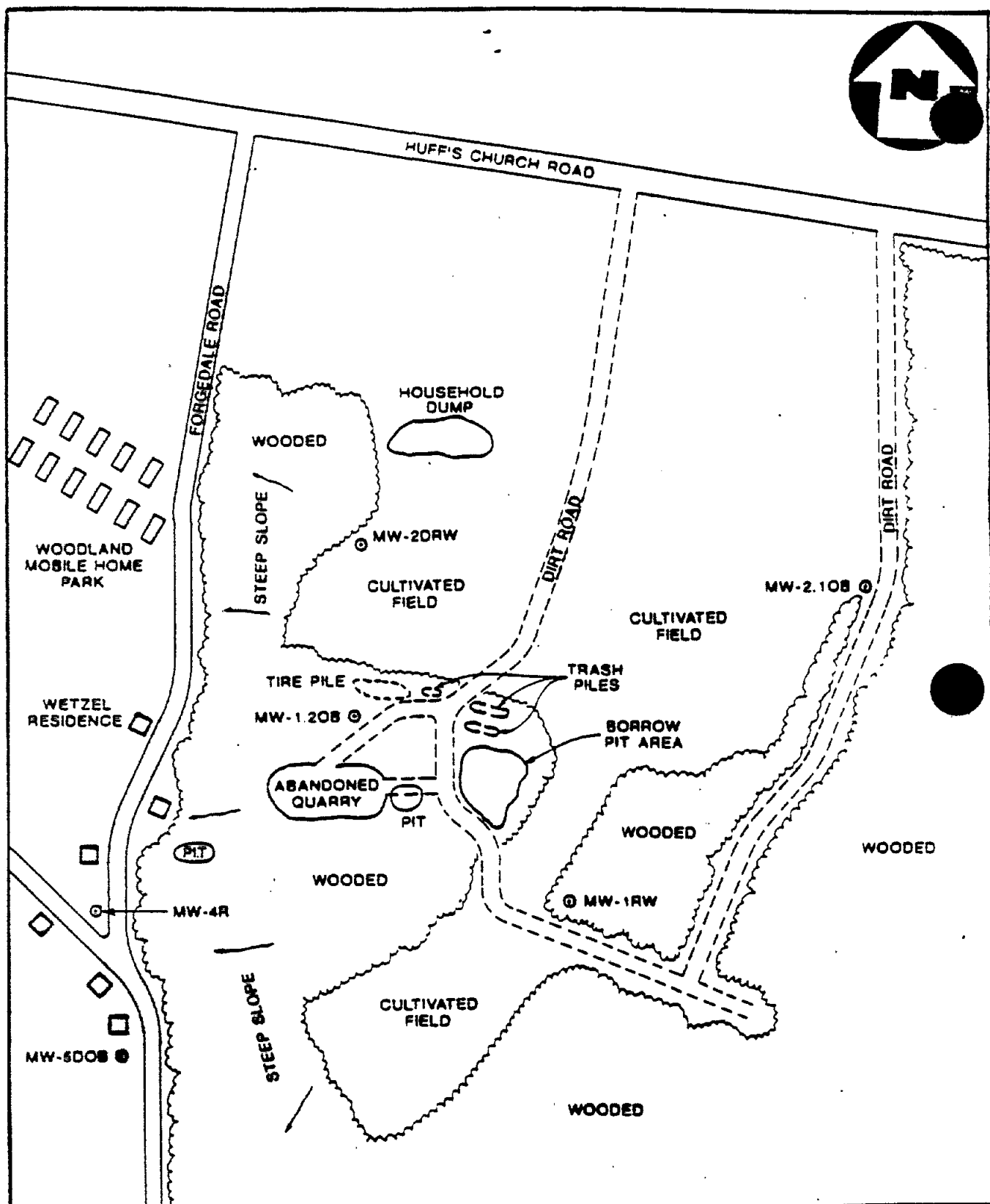
SITE LOCATION MAP
CROSSLLEY FARM SITE, BUCKS CO., PA

SCALE 1: 24000

REFERENCE 3

NUS
 CORPORATION

AR100323



SITE SKETCH
CROSSLEY FARM SITE, BUCKS CO., PA
(NO SCALE)

The drums that were dumped into the ore pit were either partially or totally full; some had lids. When the drums were dumped into the hole, the contents of the drums splashed onto the ground surface. An estimated 300 drums from Bally Case and Cooler were reportedly deposited in the ore pit (ref. no. 7).

Attention was called to the site in 1983 in response to complaints by local residents regarding contamination in their well water. The Pennsylvania Department of Environmental Resources (PA DER) initiated a groundwater sampling program in September 1983 [ref. no. 2 (p. 8)]. Results indicated elevated levels of trichloroethene (TCE) and tetrachloroethene (PCE) in the well samples. Concentrations as high as 8,500 ug/l TCE and 110 ug/l PCE were detected [ref. no. 2 (p. 161)]. Additional home well sampling by PA DER and the EPA Technical Assistance Team (TAT) contractor Roy F. Weston, Incorporated, in November 1983 confirmed the elevated TCE concentrations, prompting PA DER to issue a health advisory regarding the use of the groundwater in the area [ref. no. 2 (pp. 8 and 156 through 164)]. Carbon filter systems were installed on several of the contaminated wells [ref. no. 2 (p. 8)].

In August 1986, in response to more citizen complaints, additional rounds of sampling were collected by Roy F. Weston (TAT) in September 1986 [ref. no. 2 (pp. 1 and 8)]. TCE contamination was again confirmed; as a result, EPA requested that a regional hydrogeologic investigation be initiated in the spring of 1987 [ref. no. 2 (pp. 8 and 156 through 164)].

The EPA regional hydrogeologic investigation began in the spring of 1987 and was performed by Roy F. Weston and IT Corporation [ref. no. 2 (p. 8)]. The investigation included the construction of 21 monitoring wells, the performance of a soil gas survey, and monitoring well and residential well sampling [ref. no. 2 (pp. 6 and 14)]. Conclusions reached from the regional hydrogeologic investigation were that a large TCE contamination plume had been identified and that the source of this contamination was located near the crest of Blackhead Hill [ref. no. 2 (p. 53)].

B WASTE/SOURCE INVESTIGATION

Based on information gathered to date, one source exists at the Crossley Farms site. This source consists of excavations located on Blackhead Hill.

B-1 Source no. 1 (Blackhead Hill Excavations)

Source no. 1 consists of several excavations located on an area encompassing the crest of Blackhead Hill. This hill is located on the Crossley Farms property [ref. no. 2 (p. 8)]. In 1987 and 1988, Roy F.

Weston and IT Corporation performed a regional hydrogeologic investigation in the area of the Crossley Farms site. Hydrogeologic and analytical data document that the source of groundwater trichloroethene (TCE) contamination in the area is on Blackhead Hill (ref. no. 2 (p. 6 and 53)). A total of 21 monitoring wells were drilled, and both residential and monitoring wells were sampled [ref. no. 2 (pp. 1, 6, 21, and 44 through 47)]. Groundwater flow direction was established at the site from monitoring well and residential groundwater elevations. The groundwater at the site flows generally toward the west, southwest, and south (radially) in both the overburden and bedrock flow regimes [ref. no. 2 (pp. 6 and 21 through 27)]. Two groundwater sampling events were conducted as part of this investigation, one in November 1987 and the other in May 1988 [ref. no. 2 (p. 44)]. Background wells north and northeast of the site (hydraulically upgradient) reveal no TCE contamination, and downgradient wells show considerable TCE contamination (ref. no. 10). Wells nearest source no. 1 and hydraulically downgradient (MW-1R, MW-1.2-OB, and R-41) show the highest concentrations of TCE, with decreasing values farther away (ref. no. 10). TCE concentration contour maps from these samplings of the overburden and bedrock groundwater system confirm the location of the contaminant source on Blackhead Hill [ref. no. 2 (pp. 44 and 48 through 50)].

Several excavation features have been identified or referred to in association with the source areas, including an abandoned quarry/mining operation, a borrow pit area, an ore pit, and two smaller excavated areas identified on aerial photographs [ref. nos. 2 (p. 6), 5 (pp. 18 and 22), and 7].

The abandoned quarry/mining operation is located in a wooded area on Blackhead Hill [ref. no. 5 (pp. 24); 6]. Evidence of quarry operations date back prior to November 1946 [ref. no. 5 (p. 10)]. This excavation has been completely filled [ref. no. 4 (p.5)]. No containment features that may have prevented waste from entering groundwater have been documented in association with the quarry.

The borrow pit area is a relatively flat clearing that appears to have been created by the excavation of topsoil [ref. no. 4 (p. 6)]. The borrow pit is located in a wooded area on Blackhead Hill, approximately 450 feet east of the abandoned quarry [ref. nos. 5 (p. 26) and 6]. The precise nature and duration of operations at the borrow pit are unknown. However, activity in the borrow pit area is evident in aerial photographs as early as 1958 [ref. no. 5 (pp. 13 and 14)]. Operations in the area appear to increase significantly around 1971 [ref. no. 5 (pp. 17, 18, 19, and 20)]. A 1980 aerial photograph indicates that, unlike previous years, the borrow pit area comprised a series of smaller excavations [ref. no. 5 (p. 22)]. Based on allegations made by residents, the borrow pit area was apparently used as a staging area for drummed waste solvents that were supposedly disposed in other areas on Crossley Farm [ref. no. 2 (p.53)].

It is reported in EPA confidential file information that, between the mid-1960s and the mid-1970s, drums obtained from Bally Case and Cooler were transported to the Crossley Farm and taken up a hill to a wooded area and disposed in a hole described as an "ore pit." These drums contained mostly liquid waste. Several were described as having a characteristic "solvent" odor. An estimated 300 drums from Bally Case and Cooler were reportedly disposed in this manner (ref. no. 7).

The background history of the Bally Case and Cooler facility supports the probability that drums obtained from this facility were disposed on the Crossley Farm site. The Bally Case and Cooler facility (currently known as Bally Engineered Structures) is a local industry located in the town of Bally that has manufactured a variety of insulated containers of different material since the 1930s [ref. no. 11 (pp. 12 and 13)]. It is reported that, before 1973, TCE was the major solvent used at the facility [ref. no. 11 (pp. 38 to 40)]. This is significant because TCE is the major contaminant of concern at the Crossley Farm site [ref. no. 2 (p. 6)]. Therefore, based on the reported years of drum disposal at the Crossley Farm site (between the mid-1960s and the mid-1970s), in conjunction with the reported years of major TCE use at Bally Case (prior to 1973) and the known TCE contamination at the Crossley Farm site, it is reasonable to conclude that the reports that waste drums from Bally Case were disposed on the Crossley Farm are accurate [ref. nos. 2 (p. 6), 7, and 11 (pp. 38 to 40)].

AR100327

The abandoned quarry/mining operation is assumed to be the ore pit for the following reasons:

- The abandoned quarry/mining operation is located in a wooded area on top of Blackhead Hill, where a groundwater study indicates that the volatile organic contamination originated [ref. no. 2 (pp. 44 and 48 through 50)]. The ore pit is also described as being located in a wooded area atop a hill on the Crossley Farm property (ref. no. 7).
- The EPA confidential information states that waste was deposited in a "hole" described as an ore pit (ref. no. 7). It is reasonable to conclude that mining operations at the abandoned quarry created a "hole." This is in contrast to the borrow pit, which was described as being a relatively flat area of topsoil removal [ref. no. 4 (p. 6)]. Therefore, the ore pit mentioned in EPA confidential file information most likely refers to the site of the abandoned quarry/mining operations (ref. no. 7).

At least two other smaller excavations located in the woods on Blackhead Hill have been identified on aerial photographs. A small pit located approximately 500 feet southwest of the abandoned quarry is identified in a 1971 aerial photograph [ref. no. 5 (p. 20)]. It is not known if waste was disposed in this pit.

A 1980 aerial photograph suggests the possible existence of another small excavation located between the abandoned quarry and borrow pit [ref. no. 5 (p. 22)]. This area is also seen on a 1971 aerial photograph but was not designated as a "pit" on the EPIC photograph interpretation [ref. no. 5 (p. 20)]. It is not known if wastes were deposited in this pit, but the possibility exists based on its location on top of Blackhead Hill. Therefore, this pit is considered part of source no. 1.

In summary, a groundwater study documents that the source of TCE contamination is located on Blackhead Hill on Crossley Farm [ref. nos. 2 (pp. 6, 48, 50, and 53)]. Several excavations, including an abandoned quarry/mining operation, a borrow pit, an ore pit, and two small pits, have been identified on Blackhead Hill. These excavations are considered to be the most likely sites of waste disposal [ref. no. 2 (pp. 6 and 53)]. Allegations by local residents and statements contained in EPA confidential file information further implicate this area as the location of waste disposal activities [ref. nos. 2 (p. 53) and 7]. Based on this evidence, the reasonable conclusion can be made that waste was disposed in one or more excavations located at the top of Blackhead Hill. For the purposes of this study, a control point between the excavations has been chosen to measure target distances.

AR100328

C GROUNDWATER INVESTIGATION

Groundwater sampling was conducted in the vicinity of the site in the fall of 1983 after TCE was detected in a home well sampled earlier in the year [ref. no. 2 (pp. 8 and 156 through 169)]. PA DER and Roy F. Weston (the TAT contractor) sampled 10 residential wells in late 1983. TCE was detected in eight home wells, with concentrations of TCE as high as 10,500 ppb at the Katie Meitzler residence. PCE was detected in 3 wells, with concentrations as high as 670 ppb also at the Katie Meitzler residence [ref. no. 2 (pp. 8 and 156 through 164)].

Groundwater sampling in the area resumed in 1986 [ref. no. 2 (p. 8)]. Numerous wells were then sampled on a regular basis by Roy F. Weston. Some of the residential well sampling involved grabbing three samples: one at the well, one at the filter, and one at the tap. Concentrations as high as 22,857 ppb of TCE were detected in the Donna Wetzel well. PCE was also detected in many home well samples, although at lower concentrations than TCE [ref. no. 2 (pp. 8 and 156 through 164)].

In 1987, EPA contracted Roy F. Weston and IT Corporation to perform a regional hydrogeologic investigation in the vicinity of the site. This study included installing 21 monitoring wells and obtaining additional residential well samples [ref. no. 2 (pp. 1, 8, 14, and 44)]. The monitoring wells were designed to characterize the groundwater quality in the overburden, shallow bedrock, and deep bedrock zones [ref. no. 2 (p. 14)]. The locations of the wells are indicated in reference no. 10. The table below summarizes the concentrations of TCE found in the monitoring well sampling conducted between May 8 and 12, 1988 [ref. no. 2 (p. 46)].

Monitoring Well Data

<u>Well</u>	<u>TCE (ug/l)</u>	<u>Well</u>	<u>TCE (ug/l)</u>
MW-1-OB	1,027	MW-4 R	2,047 (B)
MW 1-R	19,630	MW-5-OB	ND
MW 1.1-OB	5,748	MW-5-DOB	69 (B)
MW 1.2-OB	6,845	MW-5-R	4,019 (B)
MW-2-OB	N/A	MW-6-OB	ND
MW-2-R	ND	MW-6-R	35 (B)
MW-2-DR	ND	MW-7-OB	ND
MW-2.1-OB	ND	MW-7-R	24
MW-3-OB	88	MW-7-DR	30 (B)
MW-3-DOB	114 (B)	MW-8-R	259 (B)
MW-4-OB	1,960		

N/A - Well not sampled

ND - Not detected

B - Adjusted for blank contamination

As part of the regional groundwater investigation, two separate residential well sampling events occurred. The first residential well sampling was between November 9 and 12, 1987 [ref. no. 2 (pp. 44 and 45)]. The following table was obtained from the regional hydrogeologic investigation report prepared by Weston and IT Corporation. See reference no. 10 for well locations.

Hereford Township Residential Well Sampling Program:
November 9 to 12, 1987
TCE Concentrations

Well Identification Number	Name	Trichloroethene (ug/l)
R-1	Audolph	ND
R-5	Berry	637
R-10	Clemmer	21.1
R-11	Crum	2.5 (a)
R-12	Debbern	409
R-13	Dewart	ND
R-16	Eckert	ND
R-17	Finegan	343 (a)
R-18	Flannery	441 (a)
R-19	Fronheiser	ND
R-20	Geisinger no. 2	ND
R-21	Grater	ND
R-22	Hausman	ND
R-23	Hill	ND
R-24	Hoffmeister	ND
R-25	Johnson	366
R-26	Karolesky	245 (a)
R-29	Meitzler, J.	564
R-30	Meitzler, K.	8,380
R-31	Miller, G.	489
R-32	Miller, L.	ND
R-34	Moyer	2,790
R-36	Sobjack	27.2
R-37	Stephens	ND
R-38	Swavely	6.0
R-39	Wagner (residence)	1,180
R-40	Wagner (tenant)	392 (a)
R-41	Wetzel, D.	12,200
R-43	Woodland Mobile Home No. 1	90.5

ND - Compound not detected.

(a) - Denotes an approximate value between the detection limit and the limit of quantification.

The second residential well sampling was conducted on May 9 and 10, 1988 [ref. no. 2 (p. 44)]. The table below is reprinted from the Roy F. Weston/IT Corporation Regional Hydrogeologic Investigation Report [ref. no. 2 (p. 47)]. (See reference no. 10 for well locations.)

Hereford Township Residential Well Sampling Program: May 9 and 10, 1988
Volatile Organic Compounds (ug/l)

Well Identification Number	Name	Methylene Chloride	Toluene	TCE	Trichloro-fluoromethane
R-1	Audolph	--	--	--	--
R-2	Bechtel (deep) (c)	--	12	--	--
R-2A	Bechtel (shallow)	--	9	--	--
R-3	Beckner	--	--	--	--
R-5	Berry	12 (a,b)	--	347	--
R-6	Brown	--	--	--	--
R-7	Brungard	21	--	--	--
R-8	Camp Mensch Mill (caretaker)	--	--	--	--
R-8A	Camp Mensch Mill (camp)	--	--	--	--
R-10	Clemmer	--	--	24 (b)	--
R-11	Crum (c)	--	--	--	--
R-12	Debbern	--	--	318	--
R-14	Donovan	--	--	--	--
R-16	Eckert	--	--	--	--
R-17	Finegan	--	--	1,280	--
R-19	Fronheiser	--	--	--	--
R-20	Geisinger no. 2	2 (a,b)	--	--	--
R-21	Grater	--	1 (a)	--	--
R-22	Hausman	--	--	--	--
R-23	Hill	--	--	--	--
R-24	Hoffmeister	--	--	--	--
R-25	Johnson	--	--	586	--
R-26	Karolesky	--	--	--	--
R-27	Kearns (barn)	--	--	--	--
R-27A	Kearns (residence)	18	--	--	--
R-28	Kuhns	17	--	24	--
R-29	Meitzler, J.	--	--	839	--

Well ID No.	Name	Methylene Chloride	Toluene	Trichloro-ethene	Trichloro-fluoromethane
R-30	Meitzler, K.	--	--	7,221	--
R-31	Miller, G. (c)	146	160 (b)	771	57
R-32	Miller, L.	--	--	--	--
R-34	Moyer	112 (b)	--	1,830	--
R-35	Sanzo	--	--	316	3 (a)
R-36	Sobjack	--	--	26	--
R-37	Stephens	14	--	--	--
R-38	Swavely	13	--	--	--
R-39	Wagner (residence)	--	--	1,890	--
R-40	Wagner (tenant)	--	--	1,414	--
R-41	Wetzel, D. (c)	--	--	9,425 (b)	101 (a)

-- Compound not detected.

(a) - Compound detected but at a concentration below the analytical detection limit for the sample run.

(b) - Concentration adjusted to correct for the presence of the compound in the laboratory blank.

(c) Additional compounds detected:

R-2: benzene - 2 (a)

R-11: acetone - 6 (a)

R-31: ethyl benzene - 53; xylene- 123 (b)

R-41: 1,1-dichloroethene - 67 (a,b); 1,1,2,2-tetrachlorethene - 224 (a)

1,1,1-trichloroethane - 52 (a)

The Weston/IT Corporation report established that the groundwater flow in the overburden sediment was to the west, southwest, and south radially from the site [ref. no. 2 (pp. 6, 22, and 23)]. This was also the case for the bedrock flow regime immediately under the site. Where groundwater contacts carbonate bedrock to the south and southwest of the site, groundwater flow direction changes to the south [ref. nos. 2 (pp. 6, 25, and 26) and 10]. The groundwater flow direction from the site is substantiated by the TCE contamination plume identified from residential and monitoring well sampling [ref. nos. 2 (p. 48) and 10)].

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 1

Name and description of the source: Blackhead Hill Excavation

Source No. 1 consists of several excavations located in a wooded area on top of Blackhead Hill, including an abandoned quarry and a borrow pit. The abandoned quarry has been filled with quarry rubble/stone [ref. nos. 4 (p. 5) and 5 (p. 24)]. The borrow pit is located approximately 450 feet east of the abandoned quarry [ref. no. 5 (p. 22)]. It is a relatively flat clearing that appears to have been used to excavate top soil. Exposed bedrock was evident at the base of the borrow pit [ref. no. 4 (p. 6)]. Several smaller pits have been identified on top of Blackhead Hill by aerial photography [ref. no. 5 (pp. 20 and 22)].

It is reported that drums obtained for Bally Case and Cooler containing mostly liquid wastes (several had a characteristic solvent odor) were disposed in a hole described as an "ore pit" in a wooded area on a hill on the Crossley Farm property (ref. no. 7). It is believed that the ore pit is one of the excavations on top of Blackhead Hill that comprises source no. 1. This conclusion is based on the description of the location of the ore pit (up a hill or a wooded area on Crossley Farm), the description of the ore pit as a "hole" (excavation), a groundwater study, which indicates that the source of the TCE contamination is located on Blackhead Hill, and the major contaminant of concern identified in the groundwater study (TCE) is the same that was used by Bally Case and Cooler during the reported disposal period (mid-1960s to mid-1970s) [ref. nos. 2 (pp. 6, 50, and 53), 7, 11 (pp. 38 to 40)].

Location of the source, with reference to a map of the site:

The Crossley Farm site is located in Hereford Township, Pennsylvania. Source no. 1 is situated in the southwestern section of the Crossley Farm property, near the top of Blackhead Hill [ref. nos. 2 (p. 6), 3 (doc. rec.), and 6 (doc. rec.)].

Containment

Gas release to air: Not evaluated

Particulate release to air: Not evaluated

Release to groundwater:

It is reported that drums containing mostly liquid (many with no lids) were dumped into an ore pit, and the contents were allowed to spill onto the ground surface (ref. no. 7). It is believed (for reasons previously detailed) that the ore pit refers to one of several excavations located on Blackhead Hill, possibly the abandoned quarry. No containment structures that would preclude contaminant infiltration to groundwater were identified by NUS FIT 3 personnel during a site reconnaissance on March 1 and 2, 1990. This is strongly supported by groundwater contamination in monitoring wells (MW-1.1-OB, MW-1.2-OB, MW-1-R) and a residential well (R-41) near the source (ref. no. 10).

Release via overland migration and/or flood: Not evaluated

2.4.1 Hazardous Substances

<u>Hazardous Substance</u>	<u>Evidence</u>	<u>Reference</u>
TCE	EPA interviews documenting Solvent disposal practice and groundwater sample analyses	2 (pp. 45, 46, and 47), 7, and 10

Monitoring well samples surrounding the site show elevated levels of TCE downgradient of the source area (ref. no. 10). Groundwater flows generally to the west, southwest, and south radially from the site. Monitoring well samples closest to the source and hydraulically downgradient revealed the highest TCE concentrations. Additionally, numerous home wells in the area have documented TCE contamination (ref. no. 10).

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds) (Mass - S)</u>	<u>Reference</u>
----------------------------	---	------------------

A hazardous constituent quantity is not available for this source.

sum: (pounds)

Hazardous Constituent Quantity Value (S): N/A

2.4.2.1.2 Hazardous Wastestream Quantity

<u>Hazardous Waste stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
300 drums	150,000	Ref. no. 7

It is reported that as many as 300 drums may have been deposited in the Blackhead Hill excavations (possibly the abandoned quarry) (ref. no. 7). In order to calculate a waste quantity, it was assumed that all the drums were completely filled.

1 drum = 50 gallons 1 gallon = 10 pounds [ref. no. 1 (table 2-5)]

$$(300 \text{ drums}) \times \frac{(50 \text{ gallon})}{\text{drum}} \times \frac{(10 \text{ pounds})}{\text{gallon}} = 150,000 \text{ pounds}$$

sum: 150,000 (pounds)

150,000 pounds divided by 5,000 = Hazardous Waste stream Quantity Value (W): 30
[ref. no. 1 (table 2-5)]

2.4.2.1.3 Volume

There is no information concerning the volume of source no. 1.

Dimension of source (yd³ or gallons):

References:

Volume Assigned Value:

2.4.2.1.4 Area

The quarry has been filled with boulders [ref. no. 5 (pp. 25 and 26)]. An accurate areal measurement of the quarry could not be made.

Area of source (ft²):

References:

Area Assigned Value:

2.4.2.1.5 Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 100*

(default)

[ref. no. 1 (section 2.4.1.1)]

*A default value of 100 was assigned because there are documented Level I targets (see section 3.3.2.2). Source hazardous waste constitute quantity data are incomplete, and the source hazardous waste quantity value would result in an assigned waste quantity factor value less than 100 [ref. no. 1 (section 2.4.1.1)].

SITE SUMMARY OF SOURCE DESCRIPTIONS

<u>Source No.</u>	<u>Source Hazardous Waste Quantity Value</u>	<u>Ground Water</u>	<u>Containment</u>		<u>Air Particulate</u>
			<u>Surface Water</u>	<u>Gas</u>	
1	100 (default value)	non-zero		Not Evaluated	

3.0 GROUNDWATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Aquifer/Stratum 1 (shallowest)

Aquifer/Stratum Name: Hardyston Formation and all interconnected units.

Description:

The aquifer of concern for the study area consists of Precambrian age crystalline metamorphic rocks, the Cambrian age Hardyston and Leithsville Formations, and the overlying saprolite (weathered parent rock). This aquifer system covers most of the study area, extending four miles in all directions from the site, except for an area southeast of the site in which the Triassic Age Brunswick Formation is present (ref. no. 14). The area not considered as part of the aquifer system is identified in ref. no. 14 southeast of the Basin Boundary fault. Since the Triassic Age Brunswick Formation is not present within two miles of the site and no contaminant plume from the site has been identified reaching the Brunswick Formation, it is not considered as part of the aquifer (ref. no. 1, section 3.0.1.2.1) (ref. no. 14). All the lithologic units making up the aquifer are utilized for water supplies [ref. no. 15 (pp. 1 to 35)].

The site and the majority of the study area are situated within the Reading Prong of the New England Physiographic Province. The southeastern quarter of the study area is situated within the Triassic Lowland Section of the Piedmont Province (ref. no. 16). A normal fault system (the basin boundary fault system) forms the boundary between the Reading Prong and the down-faulted graben of the Triassic Lowlands. These faults are not always apparent or continuous at the surface but undoubtedly occur at depth [ref. nos. 17 (pp. 2 to 3 and 10) and 11 (pp. 15 and 57 to 60)].

The site proper is underlain by the Cambrian age Hardyston Formation [ref. no. 17 (pp. 2 and 3)]. The Hardyston Formation is primarily a gray to dark gray quartzite with a basal conglomerate. The partial recrystallization of both pebbles and matrix has resulted in the formation of a hard, dense rock [ref. no. 17 (p. 9)]. Fractures are the major medium for groundwater storage and movement [ref. no. 10 (p. 4)]. Fractures in the Hardyston Formation have been observed in on-site monitoring wells [ref. no. 2 (pp. 88 and 89)].

The Cambrian age Leithsville Formation (also referred to as the Tomstown Formation) is predominantly a thin-bedded, high-magnesian dolomite that grades into partly phyllitic shales [ref. no. 19 (pp. 2 to 4)]. The Leithsville often is topographically reflected by karst topography [ref. no. 17 (p. 9)]. The Leithsville contains abundant fractures; these fractures are often solution enhanced [ref. nos. 18 (p. 14) and 19 (pp. 2 to 4)]. Groundwater flow in the Leithsville Formation is dominantly through the solution-enhanced fracture openings. Wells that intersect these channels often yield large supplies of groundwater [ref. no. 18 (p. 20)]. The Leithsville Formation penetrated by on-site monitoring wells is highly fractured [ref. no. 2 (pp. 96, 97, 99, 100, and 102)].

The Precambrian age crystalline and metamorphic rocks (sometimes referred to as the Byram and Pochuck Formations) underlie a large portion of the study area (ref. no. 14). Granitic gneiss is the dominant metamorphic facies within the study area; it co-occurs with lesser amounts of assimilated or injected hornblende gneiss [ref. no. 17 (pp. 2 to 11)]. These crystalline rocks are transected by a pervasive system of fractures that furnish storage for considerable quantities of groundwater and provide avenues for groundwater movement [ref. no. 18 (pp. 4 to 11)]. Fractures in the crystalline rocks have been observed in an on-site monitoring well [ref. no. 2 (pp. 15, 65, and 67)].

The structural history of the Reading Prong is complex and not completely understood. Multiple tectonic deformational stages, with attendant folding, overturning, and faulting, have resulted in the juxtaposition of diverse lithologies. Consequently, the stratigraphic and structural relationships of the various rock units are largely unknown and a matter of conjecture [ref. no. 2 (p. 11)].

Currently, there are two prominent hypotheses that explain the Reading Prong geology. The first hypothesis states that the Precambrian crystalline rocks have been thrust over the Paleozoic sedimentary rocks, which crop out in erosional windows through the thrust block. Under this scenario, the crystalline rocks at the site would be underlain at some unknown depth by the younger Paleozoic sedimentary rocks. The second hypothesis states that the Paleozoic sedimentary rocks were deposited in a deep syncline that subsequently was strongly sheared. Under this scenario, the crystalline and sedimentary rocks that crop out at the surface would be underlain by basically similar lithologies that extend below the surface to depths far beyond the scope of this investigation [ref. nos. 2 (p. 11) and 17 (pp. 10 and 11)].

Locally, the structural geology is dominated by three linear faults (two southwest-northeast-trending faults and one southeast-northwest-trending fault) and the variously trending faults that form the contact between the Paleozoic and Precambrian strata. The linear faults transcend formational boundaries [ref. nos. 2 (p. 12) and 17]. The delineation of the on-site contaminant plume clearly indicates these faults are preferred conduits for fluid migration [ref. no. 2 (p. 49)].

The groundwater in the Reading Prong occurs under water-table (unconfined) conditions with localized areas of semi-confined conditions [ref. no. 18 (pp. 4 and 5)]. The groundwater within the study area is believed to exist under water-table conditions, although local areas of at least partially confined conditions (the deep bedrock at monitoring well locality site no. 2) do exist [ref. no. 2 (p. 27)]. The pervasive fracture system within the bedrock prevents fully confining conditions to develop [ref. no. 2 (p. 32)].

The water-table surface map constructed from water levels measured in on-site monitoring wells and local domestic wells is similar to the surface topography [ref. no. 2 (pp. 24 to 27)]. This supports the conclusion that the local aquifer is under water-table conditions.

Barometric pressure is a relevant factor affecting water levels of monitoring wells in confined aquifers only [ref. no. 2 (p. 32)]. The barometric efficiency of an on-site deep bedrock well is very low, which indicates that the aquifer locally is not confined [ref. no. 2 (p. 32)]. This further supports the conclusion that the local aquifer is under water-table conditions.

Data collected from on-site pump tests and slug tests indicate that a very productive fracture flow-system exists throughout the area. This system is capable of supporting high yields and rapid groundwater movement [ref. no. 2 (p. 30)]. During the pump test, the pumping well, completed in the Hardyston and Leithsville Formations, caused drawdown in a well completed in the gneiss, which documents hydraulic interconnection between the formations. The results of slug tests performed on monitoring wells completed in the granite gneiss and the Hardyston and Leithsville Formations indicate that the respective hydraulic conductivities, with the exception of one tight (unfractured) well, are within two orders of magnitude [ref. no. 2 (p. 29)]. Similar hydraulic conductivities indicate likely aquifer interconnection.

Water-table surface maps constructed from the static water level measurements of the domestic and monitoring wells indicate that groundwater flows from the metamorphic rocks downgradient to the Hardyston and Leithsville Formations [ref. nos. 2 (pp. 25 to 27) and 20]. The flow of groundwater between the respective formations can only be accomplished if there is hydraulic interconnection.

Chemical analysis of local wells completed in the metamorphic rocks, the Hardyston Formation, and the Leithsville Formation indicates that TCE contamination occurs in each unit (ref. no. 10). This evidence of contaminant migration further documents the interconnection of the units.

The bedrock units within the Reading Prong are overlain by saprolite (weathered parent rock) that, in the immediate study area, is 30 to 120 feet thick [ref. no. 2 (p. 11)]. The fact that the bedrock aquifer is rapidly recharged by rainfall [ref. no. 2 (pp. 32 and 33)] supports the conclusion that the saprolite is hydraulically interconnected to the bedrock.

The rocks of the Triassic Lowland Section belong to the Brunswick Formation (ref. no. 14). The Brunswick Formation typically is a dominantly fine-grained rock composed of reddish-brown shale, mudstone, and siltstone. Locally, a coarser-grained facies known as the limestone fanglomerate is developed [ref. no. 21 (pp. 2 and 3)]. The thickness of the Brunswick Formation within the study area is approximately 16,000 feet. Regionally, the unit dips to the northwest, but local dip may vary due to the influence of local structure [ref. no. 11 (p. 58)].

The location of the basin boundary fault, as originally depicted on the regional geologic map (ref. no. 14) is incorrect. A detailed hydrogeologic study in the town of Bally has shown that the town is underlain by Triassic sediments and that the basin boundary occurs approximately 0.5 mile west of where it was originally mapped [ref. no. 11 (pp. 15 and 16)]. NUS has corrected the regional geologic map (ref. no. 14) to correctly place the border fault at an altitude of approximately 550 feet above mean sea level [ref. no. 11 (p. 57)]. This corresponds to the pronounced break in slope caused by the contact of the more resistant crystalline rocks and the less resistant sedimentary rocks. Because interconnection for the Brunswick Formation cannot be established within two miles of the site, it is not considered part of aquifer/stratum 1 [ref. nos. 1 (section 3.0.1.2.1) and 14].

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Hardyston Formation and all interconnected units

Direct Observation:

- Basis for Direct Observation:

- Hazardous Substances in the Release

Chemical Analysis:

- Background Concentration

Roy F. Weston and IT Corporation (contracted by EPA) conducted a regional hydrogeologic investigation in the vicinity of the site beginning in 1987 [ref. no. 2 (p. 1)]. As part of this investigation, a network of 21 monitoring wells were drilled between December 1987 and May 1988 [ref. no. 2 (pp. 13 and 14)]. This investigation was designed to monitor the overburden, bedrock, and deep bedrock layers [ref. no. 2 (p. 14)].

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
MW-2.1-OB (1640)	TCE	ND	5 ug/l	Ref. no. 2 (pp. 46 and 197)
MW-2-R (1641)	TCE	ND	5 ug/l	Ref. no. 2 (pp. 46 and 198)
MW-2-DR (1642)	TCE	ND	5 ug/l	Ref. no. 2 (pp. 46 and 199)
R-3 (1713)	TCE	ND	5 ug/l	Ref. no. 2 (pp. 47 and 215)
R-37 (Stephens) (890112.141)	TCE	ND	<0.5 ug/l	Ref. no. 22

*See reference no. 10 for monitoring well locations
() = sample number

Contaminated Samples

Sample ID	Depth (feet)	Date	Reference
MW-1-OB	56	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-1-R	162	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-1.1-OB	41	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-1.2-OB	44	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-3-OB	23	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-3-DOB	70	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-4-OB	21	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-4-R	237	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-5-DOB	103	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-5-R	302	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-7-R	95	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-7-DR	123	5/9/88	Ref. no. 2 (pp. 17 and 46)
MW-8-R	123	5/9/88	Ref. no. 2 (pp. 17 and 46)
R-5 (Berry)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-10 (Clemmer)	67	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-12 (Debborn)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-17 (Finegan)	102	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-25 (Johnson)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-28 (Kuhns)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-29 (Meitzler, J.)	175	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-30 (Meitzler, K.)	257	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-31 (Miller)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-34 (Moyer)	125	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-35 (Sanzo)	58.5	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)

Sample ID	Depth (feet)	Date	Reference
R-36 (Sobjack)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-38 (Swavely)	85	11/9 to 12/87	Ref. nos. 2 (p. 45) and 24 (p. 2)
R-39 (Wagner no. 1)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-40 (Wagner no. 2)	--	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
R-41 (Wetzel, D)	285	5/9/88	Ref. nos. 2 (p. 47) and 24 (p. 2)
Woodland mobile home no. 2	280	11/9 to 12/87	Ref. nos. 25 and 26 (p. 4)
Woodland mobile home no. 1	300	4/3/89	Ref. nos. 25 and 26 (p. 3)

Based on the groundwater flow direction (established in the Roy F. Weston study) generally toward the west, southwest, and south radially from the site, these wells are considered to be hydraulically downgradient from the site [ref. no. 2 (pp. 6, 22, 23, 25, and 26)].

Sample ID	Sample No.	Hazardous Substance	Concentration (ug/l)	Sample Quantitation Limit	Reference
MW-1-OB	1635	TCE	1,027	50	Ref. nos. 2 (pp. 46 and 193), 10, and 27
MW-1-R	1638	TCE	19,630	500	Ref. nos. 2 (pp. 46 and 196), 10, and 27
MW-1.1-OB	1636	TCE	5,748	500	Ref. nos. 2 (pp. 46 and 194), 10, and 27
MW-1.2-OB	1637	TCE	6,845	500	Ref. nos. 2 (pp. 46 and 195), 10, and 27
MW-3-OB	1643	TCE	88	5	Ref. nos. 2 (pp. 46 and 200), 10, and 27
MW-3-DOB	1644	TCE	114	5	Ref. nos. 2 (pp. 46 and 201), 10, and 27
MW-4-OB	1645	TCE	1,960	250	Ref. nos. 2 (pp. 46 and 202), 10, and 27
MW-4-R	1646	TCE	2,047	50	Ref. nos. 2 (pp. 46 and 203), 10, and 27

Sample ID	Sample No.	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
MW-5-DOB	1648	TCE	69	5	Ref. nos. 2 (pp. 46 and 205), 10, and 27
MW-5-R	1649	TCE	4,019	100	Ref. nos. 2 (pp. 46 and 206), 10, and 27
MW-7-R	1653	TCE	24	5	Ref. nos. 2 (pp. 46 and 210), 10, and 27
MW-7-DR	1654	TCE	30	5	Ref. nos. 2 (pp. 46 and 211), 10, and 27
MW-8-R	1655	TCE	259	5	Ref. nos. 2 (pp. 46 and 212), 10, and 27
R-5	1733	TCE	347	25	Ref. nos. 2 (pp. 47 and 235), 10, and 27
R-10	1720	TCE	24	5	Ref. nos. 2 (pp. 47 and 222), 10, and 27
R-12	1739	TCE	318	25	Ref. nos. 2 (pp. 47 and 241), 10, and 27
R-17	1750	TCE	1,280	50	Ref. nos. 2 (pp. 47 and 252), 10, and 27
R-25	1740	TCE	586	25	Ref. nos. 2 (pp. 47 and 242), 10, and 27
R-28	1746	TCE	24	5	Ref. nos. 2 (pp. 47 and 248), 10, and 27
R-29	1732	TCE	839	50	Ref. nos. 2 (pp. 47 and 234), 10, and 27
R-30	1738	TCE	7,221	250	Ref. nos. 2 (pp. 47 and 240), 10, and 27
R-31	1731	TCE	771	50	Ref. nos. 2 (pp. 47 and 238), 10, and 27
R-34	1715	TCE	1,830	100	Ref. nos. 2 (pp. 47 and 217), 10, and 27

Sample ID	Sample No.	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
R-35	1725	TCE	316	5	Ref. nos. 2 (pp. 47 and 227), 10, and 27
R-36	1718	TCE	26	5	Ref. nos. 2 (pp. 47 and 220), 10, and 27
R-38	9197	TCE	6†	2	Ref. nos. 2 (pp. 172 and 175), 10, and 27
R-39	1737	TCE	1,890	100	Ref. nos. 2 (pp. 47 and 274), 10, and 27
R-40	1736	TCE	1,414	100	Ref. nos. 2 (pp. 47 and 238), 10, and 27
R-41	1722	TCE	9,425	250	Ref. nos. 2 (pp. 47 and 224), 10, and 27
Woodland mobile home no. 2	9193	TCE	90.5†	2	Ref. nos. 2 (pp. 171, 172, and 176), 10, 26 (p. 4), 27, and 29
	1102304	TCE	129.4	5	
Woodland mobile home no. 1	1102303	TCE	162.5	5	Ref. nos. 10, 26 (p. 3), and 29

Note: Sample ID designated with an "R" corresponds to a domestic well sample.
Reference no. 10 indicates locations of well samples.
Reference no. 27 explains how the sample quantitation limit was derived.

†Although there was no background sample taking during the November 1987 sampling event, it is concluded that the May 1988 background sample (R-3) is adequate to serve as a background sample for the November 1987 sampling. The reason for coming to this conclusion is presented below (ref. no. 2 (pp. 45 and 47)).

1. The relatively short time between sampling events (6 months).
2. The same trend is seen in both sampling events. Twenty-six of 29 wells that were sampled during the November 1987 sampling were resampled in May 1988. Wells that revealed contamination above the quantitation limit in November 1987 also showed contamination in May 1988 (exception R-38). Wells that showed no contamination above the sample quantitation limit in November 1987 also showed no contamination in May 1988 (exception R-17).
3. Generally, the contamination detected in both sampling events were within one order of magnitude (exception R-40 Wagner).

Attribution:

Analytical and hydrogeologic data, which support the location of the source area (see section 2.2, doc. rec.), provide significant evidence that the TCE contamination is attributable to the site. TCE is the major contaminant of concern at the Crossley Farm site [ref. no. 2 (p. 6)]. It is reported that waste solvent drums that were obtained from Bally Case and Cooler were disposed on Crossley Farm in the mid-1960s to mid-1970s (ref. no. 7). In a remedial investigation conducted at Bally Engineered Structure (formerly Bally Case and Cooler), it was determined that TCE was the main solvent used before 1973 [ref. no. 11 (pp. 13, 38, 39, and 40)]. Based on the suspected years of drum disposal at the site (mid-1960s to mid-1970s) and the known use of TCE at the Bally Case and Cooler facility, it is reasonable to conclude that the drums obtained from Bally Case and Cooler and deposited on site during this time likely contained TCE [ref. no. 7 and 11 (pp. 38, 39, and 40)]. It is not known what other wastes may have been deposited at the site.

Hazardous Substances Released

TCE [ref. no. 2 (p. 6)]

- Level I Samples

Sample ID: 16 residential wells and Woodland Mobile Home Park well nos. 1 and 2.

Reference for Benchmarks: 30

Well ID	Hazardous Substance	Hazardous Substance Concentration	Benchmark Concentration	Benchmark
16 residential wells	TCE	6 to 9,425 ug/l	5	MCL†
Woodland Mobile Home Park No. 2	TCE	129.4 ug/l	5	MCL
Woodland Mobile Home Park No. 1	TCE	162.5 ug/l	5	MCL

Also see section 3.3.2.2 of the documentation record for details of the Level I concentrations in these wells.

† - Maximum Contaminant Level

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Groundwater Observed Release Factor Value: 550
[ref. no. 1 (sec. 3.1.1)]

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

Hazardous Substance	Source No.	Toxicity* Factor Value	Mobility† Factor Value	Toxicity/†† Mobility	Reference
TCE	1	10	1	10	see below

* See reference nos. 1 (table 2-4) and 31 (p. 11).

† TCE meets the criteria for an observed release resulting in a mobility factor of 1 [ref. no. 1 (section 3.2.1.2)].

†† See reference no. 1 (table 3-9).

=====

Toxicity/Mobility Factor Value: 10

3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1 (Blackhead Hill excavations)	30	no

Sum of Values: 30

Assigned Waste Quantity Factor Value = 100 (default value)*

* A default value of 100 was assigned because there are documented Level I targets (see section 3.3.2.2). Source hazardous waste constituent quantity data are incomplete, and the source hazardous waste quantity value would result in an assigned waste quantity factor value of less than 100 [ref. no. 1 (section 2.4.1.1)].

3.2.3 Waste Characteristics Factor Category Value

Toxicity/ Mobility	X	Hazardous Waste Quantity Value	
10		100	= 1,000

Toxicity/Mobility Factor Value X Hazardous
Waste Quantity Factor Value: 1,000

=====

Waste Characteristics Factor Category Value: 6
[ref. no. 1 (table 2-7)]

3.3 TARGETS

Well	Distance From Source (miles)	Aquifer	Level I Contam. (Y/N)	Level II Contam. (Y/N)	Potential Contam. (Y/N)	Reference
R-31†	0.12	1	Y	N	N	nos. 2 (pp. 45, 47, 177, and 223) and 10
R-41†	0.13	1	Y	N	N	nos. 2 (pp. 45, 47, 179, and 224) and 10
R-30†	0.17	1	Y	N	N	nos. 2 (pp. 45, 47, 178, and 240) and 10
Woodland Mobile Home Park no. 1	0.17	1	Y	N	N	nos. 2 (pp. 45, 172, and 176), 10, and 26
Woodland Mobile Home Park no. 2	0.17	1	Y	N	N	nos. 2 (p. 172), 10, and 26
R-25†	0.19	1	Y	N	N	nos. 2 (pp. 45, 47, 176, and 242) and 10
R-29†	0.19	1	Y	N	N	nos. 2 (pp. 45, 47, 178, and 234) and 10
R-5†	0.21	1	Y	N	N	nos. 2 (pp. 45, 47, 179, and 235) and 10
Home well (HW)	>0 to 0.25	1	N	N	Y	nos. 32 and 33 (doc. rec.)
R-34†	0.28	1	Y	N	N	nos. 2 (pp. 45, 47, 177, and 217) and 10
R-17†	0.29	1	Y	N	N	nos. 2 (pp. 47 and 252) and 10
R-38†	0.39	1	Y	N	N	nos. 2 (pp. 45 and 175) and 10
R-10†	0.39	1	Y	N	N	nos. 2 (pp. 45, 47, 175, and 222) and 10
R-36†	0.39	1	Y	N	N	nos. 2 (pp. 45, 47, 176, and 220) and 10

Well	Distance From Source (miles).	Aquifer	Level I Contam. (Y/N)	Level II Contam. (Y/N)	Potential Contam. (Y/N)	Reference
R-40	0.45	1	Y	N	N	nos. 2 (pp. 47 and 238) and 10
8 HWs	> 0.25 to 0.50	1	N	N	Y	nos. 32 and 33 (doc. rec.)
R-39†	0.53	1	Y	N	N	nos. 2 (pp. 45, 47, 177, and 239) and 10
R-35†	0.54	1	Y	N	N	nos. 2 (pp. 47 and 227) and 10
R-12†	0.92	1	Y	N	N	nos. 2 (pp. 45, 47, 177, and 241) and 10
111 HWs	> 0.50 to 1.00	1	N	N	Y	nos. 32 and 33 (doc. rec.)
293 HWs	> 1 to 2	1	N	N	Y	nos. 32 and 33 (doc. rec.)
Bally Municipal Authority (spring)	2.15	1	N	N	Y	nos. 32 and 33 (doc. rec.)
637 HWs	> 2 to 3	1	N	N	Y	nos. 32 and 33 (doc. rec.)
653 HWs	> 3 to 4	1	N	N	Y	nos. 32 and 33 (doc. rec.)
R-28†*	> 1 to 4	1	Y	N	N	nos. 2 (pp. 47 and 248) and 10

† See section 3.3.2.2 of the documentation record.

* The exact location of well R-28 (Kuhns residence) is not known. However, it is reasonable to conclude that this well is located within four miles of the site (see section 3.3.2.2 of the documentation package and reference no. 10).

3.3.1 Nearest Well

Well: Seventeen wells within a 1-mile radius of the site exhibit level I contamination levels.

Level of Contamination (I, II, or potential): I

If potential contamination, distance from source in miles: N/A

See section 3.3.2.2 of the documentation record.

=====

Nearest Well Factor Value: 50
[ref. no. 1 (table 3-11)]

3.3.2 Population

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

TCE is the major contaminant of concern at the Crossley Farm site [ref. no. 2 (p. 6)]. It is reported that waste solvent drums that were obtained from Bally Case and Cooler were disposed on Crossley Farm in the mid-1960s to mid-1970s (ref. no. 7). In a remedial investigation conducted at Bally Engineered Structure (formerly Bally Case and Cooler), it was determined that TCE was the main solvent used before 1973 [ref. no. 11 (pp. 13, 39, and 40)]. Based on the suspected years of drum disposal at the site (mid-1960s to mid-1970s) and the known use of TCE at the Bally Case and Cooler facility, it is reasonable to conclude that the drums obtained from Bally Case and Cooler and deposited on site during this time contained TCE [ref. no. 7 and 11 (pp. 38, 39, and 40)]. Analytical and hydrogeologic data, which support the location of the source area being at the crest of Blackhead Hill (see section 2.2, doc. rec.), provide significant evidence that the TCE contamination is attributable to the site.

Groundwater direction at the site was established in the Weston report to be generally toward the west, southwest, and south radially from the site [ref. no. 2 (pp. 6, 22, 23, 25, and 26)]. The level I wells identified are hydraulically downgradient of the site (ref. no. 10).

Observed Release

- No TCE was detected in background samples MW-2.10B, MW-2-R, MW-2-DR, and R-3 and R-37 (ref. nos. 10 and 22).
- The TCE contamination (as described above) is attributable to the site. Currently, EPA is unaware of any other source of TCE contamination.
- The media-specific benchmark [which is in this case the Maximum Contaminant Level (MCL)] for TCE is 5 ppb [ref. no. 30 (p. 7)]. All wells listed below exceed this level:

Well	Contaminant	Concentration		Health-Based Benchmark (ppb)*	Population††	Reference
		9/87	5/88			
R-31	TCE	489	771	5	2.66	no. 2 (pp. 45, 47, 177, and 223)
R-41	TCE	12,200	9,425	5	2.66	no. 2 (pp. 45, 47, 179, and 224)

Well	Contaminant	Concentration		Health-Based Benchmark (ppb)*	Population**	Reference
		9/87	5/88			
R-30	TCE	8,380	7,221	5	2.66	no. 2 (pp. 45, 47, 178, and 240)
Woodland Mobile Home Park no. 2	TCE	90.5	129**	5	95.76	nos. 2 (pp. 45, 172, and 176) and 26 (p. 4)
Woodland Mobile Home Park no. 1	TCE	N/A	162**	5	(included with no. 1 above)	nos. 2 (p. 172) and 26 (p. 3)
R-25	TCE	366	586	5	2.66	no. 2 (pp. 45, 47, 176, and 242)
R-29	TCE	564	839	5	2.66	no. 2 (pp. 45, 47, 178, and 234)
R-5	TCE	637	347	5	2.66	no. 2 (pp. 45, 47, 179, and 235)
R-34	TCE	2,790	1,830	5	2.66	no. 2 (pp. 45, 47, 177, and 217)
R-17	TCE	343†	1,280	5	2.66	no. 2 (pp. 45, 47, 179, and 252)
R-38	TCE	6	ND	5	2.66	no. 2 (pp. 45, 47, 175, and 218)
R-10	TCE	21.1	24	5	2.66	no. 2 (pp. 45, 47, 175, and 222)
R-36	TCE	27.2	26	5	2.66	no. 2 (pp. 45, 47, 176, and 220)
R-40	TCE	392†	1,414	5	2.66	no. 2 (pp. 45, 47, 178, and 238)
R-39	TCE	1,180	1,890	5	2.66	no. 2 (pp. 45, 47, 177, and 239)
R-35	TCE	--	316	5	2.66	no. 2 (pp. 47 and 227)
R-12	TCE	409	318	5	2.66	no. 2 (pp. 45, 47, 177, and 241)
R-28	TCE	--	24	5	2.66	no. 2 (pp. 47 and 248)

Total level I population = 138.32

- * Health-based benchmark is the MCL for TCE [ref. no. 30 (p. 7)]
- ** From PA DER sampling conducted on April 3, 1989 (ref. no. 26)
- * Approximate value
- ** Domestic wells are assumed to serve the average number of persons per household for Berks County, Pennsylvania (2.66) (ref. no. 34). The Woodland Mobile Home Park consists of 36 trailers [ref. no. 4 (p. 7)]. Each trailer is assumed to contain the average number of persons per household for Berks County, Pennsylvania (36 X 2.66 = 95.76).

=====

Population Served by
Level I Wells: 138.32 X 10 = Level I Concentrations Factor Value: 1,383

3.3.2.4 Potential Contamination

Other than Karst Aquifer

Distance Category	Population	Reference	Distance-Weighted Population Value [ref. no. 1 (table 3-12)]
0 to 0.25	3	no. 33 (doc. rec.)	4
>0.25 to 0.50	21	no. 33 (doc. rec.)	11
>0.50 to 1.00	295	no. 33 (doc. rec.)	52
>1 to 2	779	no. 33 (doc. rec.)	94
>2 to 3	1,714	no. 33 (doc. rec.)	212
>3 to 4	1,847	no. 33 (doc. rec.)	131

Sum of Distance-Weighted Population Values: 504

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Sum of Distance Weighted Population Values 504 ÷ 10 = Potential Contamination Factor Value: 50

3.3.3 RESOURCES

Well	Aquifer	Resource Use	Reference
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No resource uses for groundwater have been documented within the study area.

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Resources Factor Value: 0
[ref. no. 1 (section 3.3.3)]

3.3.4 WELLHEAD PROTECTION AREA

Area	Use	Reference	Value
------	-----	-----------	-------

No wellhead protection areas have been designated.

Wellhead Protection Area Factor Value: 0

Targets Summary

Nearest well factor value:	50
Level I concentrations factor value:	1,383
Level II concentrations factor value:	N/A
Potential contamination factor value:	50
Resources factor value:	0
Wellhead protection area factor value:	0
Total groundwater migration pathway targets:	1,483

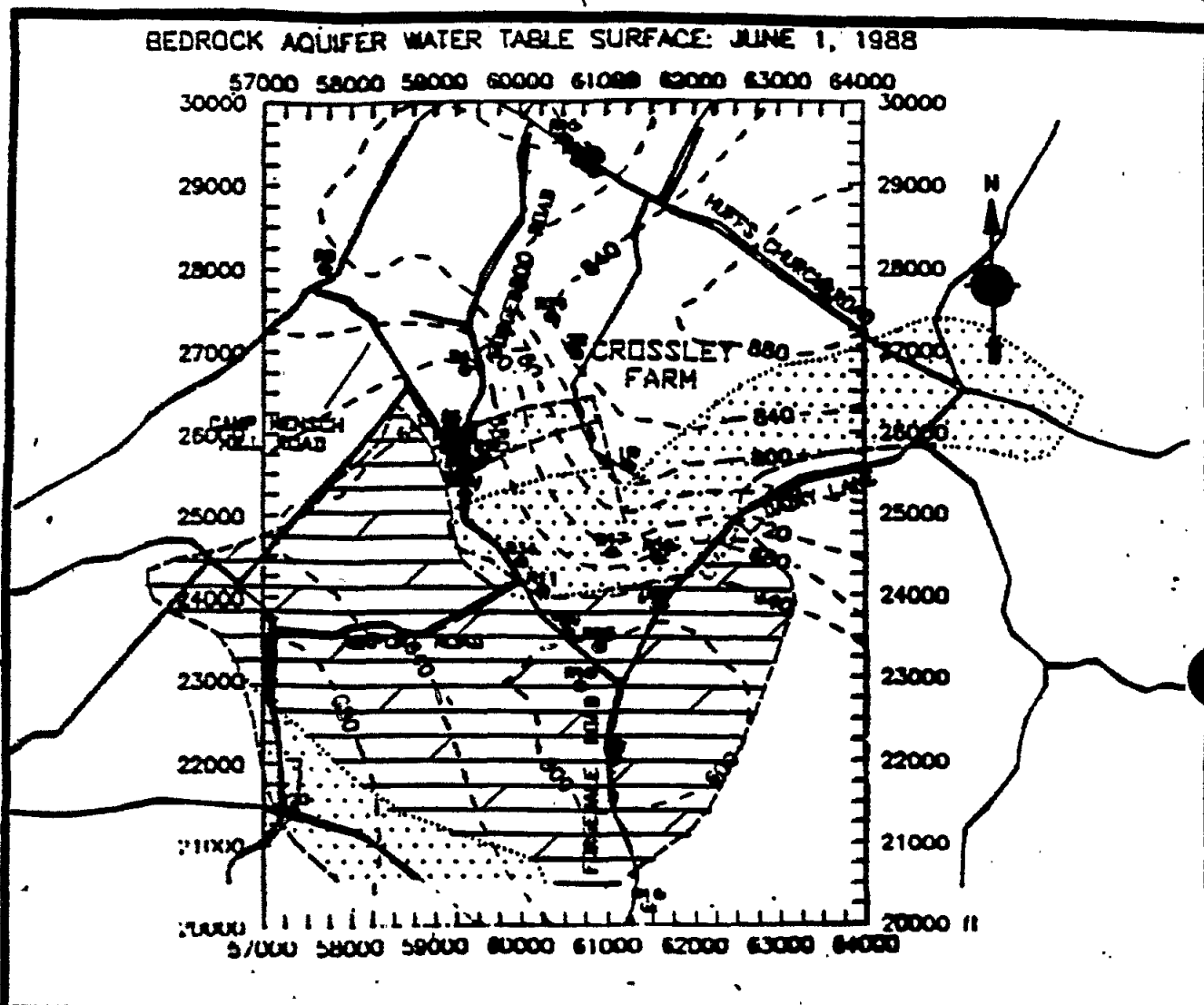
GROUNDWATER MIGRATION PATHWAY SCORE CALCULATION

<u>Likelihood of Release</u>	X	<u>Waste Characteristics</u>	X	<u>Targets</u>	
550		6		1,483	= 4,893,900 ÷ 82,500 = 59.32*




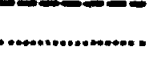



*Pathway score subject to a maximum of 100

BEDROCK AQUIFER GROUNDWATER FLOW IN RELATION TO GEOLOGIC UNITS
FIGURE 3

PROJECT AREA GEOLOGY
 This figure was constructed through the combination of Reference 2, pages 12 and 21



LEGEND

-  BYRAM GRANITE GNEISS
-  POCHUCK GNEISS
-  HARDYSTON FORMATION
-  LEITHSVILLE FORMATION
-  FAULT
-  CONTACT
-  LOCATION OF SELECTED REAC INSTALLED BEDROCK MONITORING WELLS



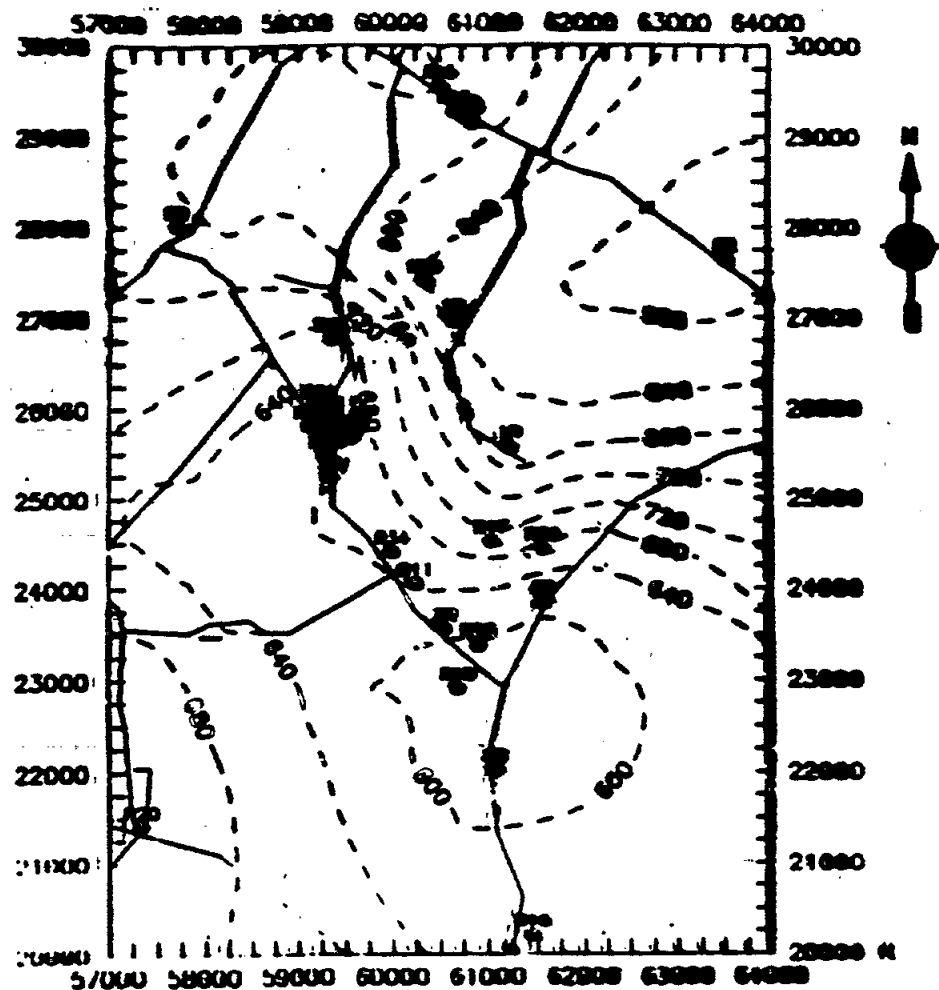
SOURCE: Buckwalter (1959)

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BEDROCK AQUIFER GROUNDWATER FLOW IN RELATION TO GEOLOGIC UNITS

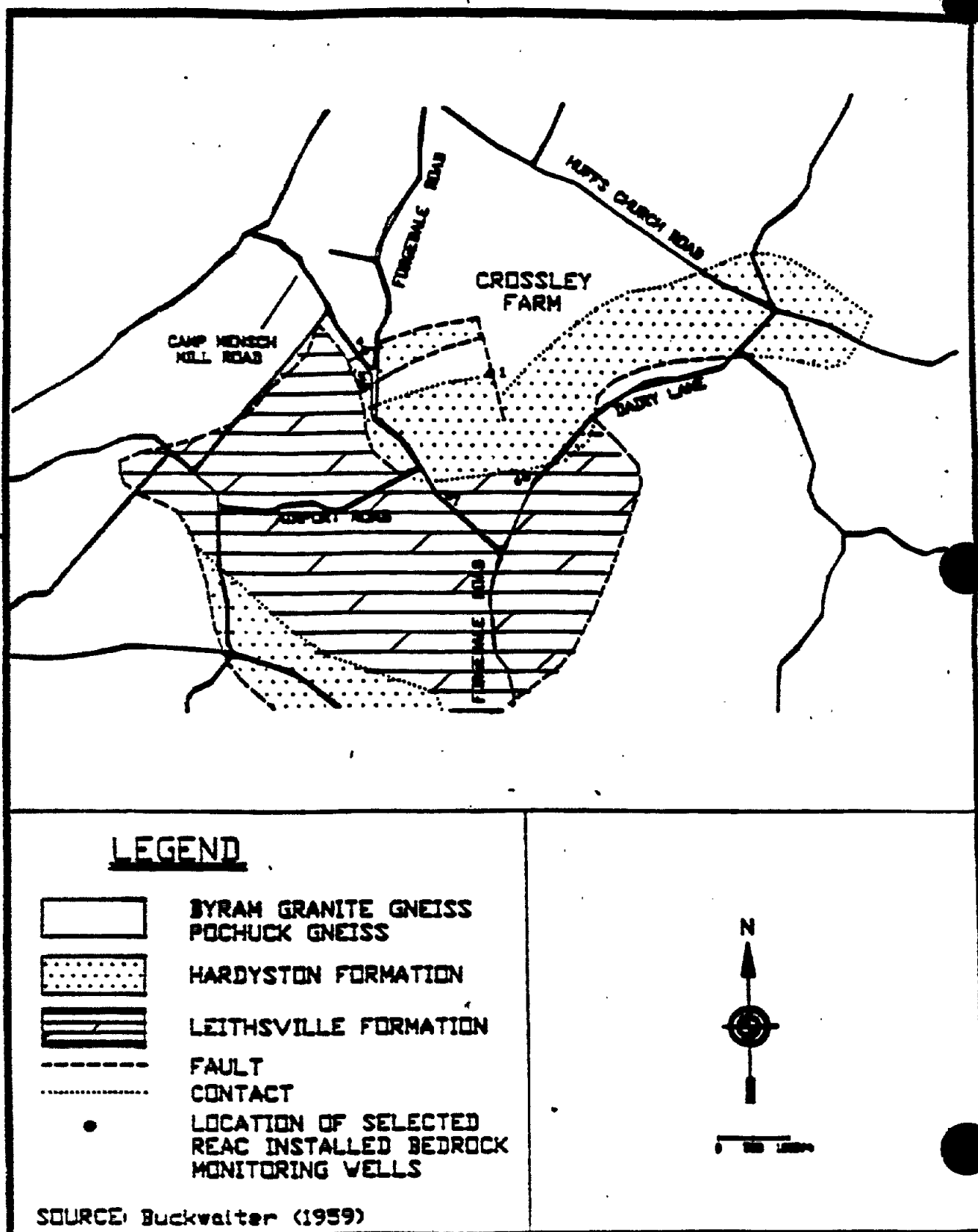
This figure was constructed through the combination of Reference 2, pages 12 and 25.

BEDROCK AQUIFER WATER TABLE SURFACE: JUNE 1, 1988



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FIGURE 3
PROJECT AREA GEOLOGY



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CALCULATION OF SAMPLE QUANTITATION LIMITS

Organic Analysis

It is currently not possible to report limits of detection for Contract Laboratory Program (CLP) organic analysis data. CLP laboratories are required to report the contract required limit of quantitation (CRQL), which is a generic estimate of the method quantitation limit that does not account for either laboratory-specific or instrument-specific differences in sensitivity. Not only is there no contract requirement to calculate a limit of detection for organic data, there is no established consensus on what the definition of the limit of detection should be for gas chromatography/mass spectrometry (GC/MS) data or how it should be calculated (ref. no. 28). Therefore, in the Weston Report (ref. no. 2) the detection limit on the data sheets is actually the CRQL multiplied by the dilution factor. The sample quantitation limit is thus equal to this number.

Inorganic Analysis

Since the sample quantitation limit for inorganic analyses from Crossley Farms cannot be established, the contract required detection limit (CRDL) is used to evaluate an observed release. The CRDL for inorganic analyses can be calculated by multiplying the instrument detection limit (IDL) by the sample dilution factor.

AR100363

Calculation Sheet
For Groundwater Population Targets

Persons residing within the four-mile-radius study area obtain their potable supply from groundwater sources. Two public water supply companies, the Bally Municipal Authority (BMA) and the Woodland Mobile Home Park (WMHP), serve persons in the study area. Those persons not served by public water are assumed to obtain their potable supply from domestic wells.

Service areas and public supply sources located within the study area are indicated on reference no. 32.

The calculations used to determine the number of groundwater population targets are listed below.

Sixteen domestic wells and 2 wells serving WMHP are documented to be contaminated with TCE at concentrations meeting Level I criteria (see section 3.3.2.2 of the documentation record).

The population served by each of the actually contaminated domestic wells is assumed to be the average number of persons per household for Berks County, Pennsylvania (2.66 persons per household) (ref. no. 34). Blended water from the 2 wells serving WMHP is the source of supply for the 36 trailers [ref. nos. 4 (p. 7) and 25]. The number of persons obtaining water from these wells can be calculated by multiplying the number of trailers by the average number of persons per household for Berks County, Pennsylvania ($36 \times 2.66 = 95.76$ persons served by the WMHP wells) (ref. no. 34).

The remaining population in the study area obtains its potable supply from potentially contaminated targets.

BMA serves 1,200 persons in the municipality of Bally, located between 2.5 and 3.3 miles southeast of the site [ref. nos. 32, 35, and 36 (p. 3)]. Two wells and a spring supply BMA with water [ref. nos. 35 and 37 (p. 2)]. Only the spring is located within the aquifer of concern (ref. no. 32). The 1989 annual production figures for the BMA sources are summarized in the table below [ref. no. 37 (p.2)].

AR100364

Source	1989 Production [gallons per year (gpy)]	Percent of Total Production
Spring	21,200 gallons per day (gpd) X 79 days = 1,674,800 gpy	1.7
BMA well no. 2	307,973 gpd X 304 days = 93,623,792 gpy	92.8
BMA well no. 3	38,504 gpd X 144 days = 5,544,576 gpy	5.5

Total Annual Production = 100,843,168 gallons

Since BMA no. 2 contributes greater than 40 percent of the total supply to the system, the population served by the system is apportional to each source based on the source's relative contribution to the system [ref. no. 1 (sec. 3.3.2)]. Only the population served by the spring is considered for potential targets.

BMA Source	Percent of Total Production	X	Population Served by System	=	Population Served by BMA Source
Spring	1.7		1,200		20
Well no. 2	92.8		1,200		1,114
Well no. 3	5.5		1,200		66

Persons not served by public supply systems are assumed to obtain their water from domestic wells. The house-count method was used to determine the number of domestic wells located in the study area. Between zero and 0.5 mile, ref. no. 10 was utilized to count houses. Between 0.5 and four miles, ref. no. 32 was used. Level I targets were not considered for potential targets. The target population was calculated by multiplying the number of houses (wells) times the average number of persons per household for the county in which the house is located. The calculation of the population served by domestic wells subject to potential contamination is summarized below.

AR100365

Distance (miles)	Number of Wells	X	County Average Persons/Household*	=	Population Served**
0 to 0.25	1†		2.66		3
> 0.25 to 0.50	8		2.66		21
> 0.50 to 1.00	111		2.66		295
> 1 to 2	293		2.66		779
> 2 to 3	637		2.66		1,694
> 3 to 4	653		2.66		1,737
	42		2.63		110

*Berks County = 2.66

Lehigh County = 2.63

**Rounded to nearest integer

†This well is (R-9) on ref. no. 10.

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The following tables summarizes the groundwater migration pathway population targets.

Level I Targets

Distance From Site (miles)	Well	Population Served
0.12	R-31	2.66
0.13	R-41	2.66
0.17	R-30	2.66
0.17	WMHP no. 1 WMHP no. 2	95.76
0.19	R-25	2.66
0.19	R-29	2.66
0.21	R-5	2.66
0.28	R-34	2.66
0.29	R-17	2.66
0.39	R-38	2.66
0.39	R-10	2.66
0.39	R-36	2.66
0.45	R-40	2.66
0.53	R-39	2.66
0.54	R-35	2.66
0.92	R-12	2.66
>1 to 4	R-28	2.66
Total Level I Target Population: 138.32		

See sections 3.3 and 3.3.2.2 of the documentation record.

Please note that the subject site is underlain by non-karst formations. Therefore, all potentially contaminated targets in the study area are evaluated as deriving groundwater from formations other than karst [ref. no. 1 (sec. 3.3.2.4) and sec. 3.0.1 of the documentation record].

AR100367

Potentially Contaminated Targets

Distance (miles)	Groundwater Source	Population Served	Distance Category Total Population
0 to 0.25	1 domestic well	3	3
> 0.25 to 0.50	8 domestic wells	21	21
> 0.50 to 1.0	111 domestic wells	295	295
> 1 to 2	293 domestic wells	779	779
> 2 to 3	637 domestic wells	1,694	1,714
	BMA spring	20	
> 3 to 4	695 domestic wells	1,847	1,847

Note: The potentially contaminated targets are derived from the total population using groundwater within the study area minus any Level I or Level II targets.

AR100368

Attachment 1

LIST OF NAMES AND ADDRESSES OF PRPS

1. Mr. Lothar D. Gumberich
Vice President for Marketing
Bally Engineered Structures. Inc.
20 North Front Street
P.O. Box 98
Bally, PA 19503
2. Mr. Michael G. Lederman
Vice President and Secretary
Sunbeam-Oster, Inc.
Center City Tower
650 Smithville Street
Suite 2100
Pittsburgh, PA 15222-3910
3. Mr. Harry Crossley
Crossley Brothers Farm
R.R. Box 596
Barto, PA 19504
4. Mrs. Ruth Crossley
Crossley Brothers Farm
R.R. Box 596
Barto, PA 19504

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